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TROPICAL FORESTS IN THE KYOTO PROTOCOL
Prospects for Carbon Offset Projects After Buenos Aires

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1.0 Background

The 1995 Intergovernmental Panel on Climate Change (IPCC) assessment concluded that rising atmospheric concentrations of major greenhouse gases (GHG) such as carbon dioxide (CO_2), chlorofluorocarbons, methane, nitrogen oxides and tropospheric ozone may lead to increases in global temperatures and other environmental changes[1]. Based on data and information about annual average estimates of GHG emissions for the 1980-90 period, the IPCC projected that emissions of GHGs could lead to a 1 to 3.5 C rise in global mean surface air temperatures by the year 2100 -- an increase which would surpass the cumulative change in global temperature over the past 10,000 years.

Emissions of GHGs result from human activities in the energy sector, land use change and forestry sectors, and from industry and waste management. Energy production from fossil fuels and some industrial processes such as cement production leads to the release of carbon dioxide and methane emissions. Biomass burning and decomposition from forestry and agriculture mostly releases carbon dioxide and methane, while agricultural systems are largely responsible for the release of methane and, to a smaller extent, nitrous oxide from paddy fields, livestock, and soil management.

The IPCC report estimates that the total anthropogenic emissions are estimated to be 7.1 ± 1.5 Gt C/yr[e], with emissions from fossil fuel combustion and cement production contributing about 5.5 ± 0.5 Gt C/yr to the total. Most of the net emissions from land use changes come from the lower latitudes, with an estimated contribution of 1.6 ± 0.5 Gt C/yr[2]. A potential to release large amounts from this sector exists since there is about 1000 Gt C stored in the forests of the world.

However, the forestry sector also has the ability to remove CO2 from the atmosphere through photosynthesis. The last IPCC Report on Climate Change (op. cit.) states that if various measures are implemented in the forestry sector, it is estimated that, between 1.1 and 1.8 Gt C/yr can be sequestered in 50 years. As such, the possibility of emission reductions in forestry and potential for increasing carbon sequestration gives the sector an elevated role in measures to mitigate climate change as envisaged in the Kyoto Protocol.

This paper has two objectives: (1) to highlight some pertinent Articles of the Kyoto Protocol which have a bearing on forestry and forest practices, and (2) to examine how innovative forest management techniques fit in the Protocol, with a specific emphasis on the reduced impact logging project (RIL®) and the C-offset reforestation project in Sabah, Malaysia.

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[e] **1Gt C equals 1 billion metric tonnes of carbon, which is equivalent to 3.67 billion tonnes of CO2**

2.0 Land use Change and Forestry under Kyoto

2.1 The Kyoto Protocol

The Third Conference of the Parties (COP-3) to The United Nations Framework Convention on Climate Change (UNFCCC) was held in Kyoto, Japan from 1 to 11 December 1997. The UNFCCC was established in 1992 at the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro (Brazil), with the main objective being: "*to stabilize atmospheric GHG[f] concentration at a level that would prevent dangerous anthropogenic interference with the climate system".*

The Convention is a treaty, which provides a framework of principles, and processes through which subsequent protocols or specific mechanisms and actions can be developed and agreed. The Kyoto Protocol is one such agreement on mechanisms to stabilize and reduce GHG emissions[3]. The key elements of the protocol can be summarized as:

(i) It provides legally binding limits for Amex 1 countries (mostly industrialized countries) on their emissions of 6 GHG, relative to emissions in 1990, based on a five-year budget period (2008 to 2012).

(ii) It allows Parties flexibility with respect to national implementation of their commitments through specifically sanctioned activities, with a possibility of additional activities.

(iii) It provides flexibility in the international context by providing for the use of emissions trading and other market-based mechanisms, including a mechanism for cooperative projects between developed and developing countries.

(iv) It is comprehensive in that it covers GHG emissions by sources and removals by sinks, in all sectors, save for some restrictions in land use change and forestry.

The Protocol will enter into force 90 days after at least 55 Parties to the Convention have ratified it, including Annex I[g] countries accounting for at least 55 percent of total CO2 emissions in 1990.

2.2 Contents of the Articles of Kyoto Protocol

The key structure of the protocol is shown in Box 1 below:

BOX 1: Articles of the Kyoto Protocol

(1)	Article 1:	Definitions of terms used.
(2)	Articles2,3,5 &7:	Substantive obligations of Annex I countries.
(3)	Article 10:	Elaboration of UNFCCC commitments for all Parties to the Protocol.
(4)	Article 11:	Restates UNFCCC Articles 4.3 and 11. It also provides guidance on financing by Annex I countries to assist developing countries in implementing Article 10 above.
(5)	Articles 9,13,14,15 & 16:	Institutional roles of the UNFCCC COP, Secretariat, and subsidiary bodies and processes with respect to the Protocol.
(6)	Articles 4,6,12 & 17:	Authorize the use of various joint mechanisms between parties (including trading) to meet part of their GHG reduction commitments.
(7)	Article13,16, 18:	Mandates the development of compliance procedures and mechanisms, .
(8)	Article 14 & 19 :	Provision of the dispute settlement.
(9)	Articles 20 to 27:	Procedural requirements e.g. amendment, entry into force, voting, reservations, withdrawal, official language and signatories.
(10)	Annex A:	Lists the GHGs and sector/source categories covered by the Protocol.
(11)	Annex B:	Lists the emissions reduction target for each Annex I country.

[f] Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (NO_2), and HFCs, PFCs, and SF_6.

[g] Annex I countries are those Parties listed under Annex I of the FCCC signed in Rio in 1992.

2.3 Included Activities in LUCF

The articles of substantive relevance to land use change and forestry are Articles 3 (obligations), 5 (methodologies), 6 & 17 (joint implementation and trading), and Article 12 (clean development mechanism – (CDM)). The main role of forests as sinks and sources in the Protocol is described under Article 3 paragraph 3(see Box 2).

BOX 2: Article 3, Paragraph 3 Kyoto Protocol

The net changes in greenhouse gas emissions by sources and removals by sinks resulting from **direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in stocks in each commitment period,** shall be used to meet the commitments under this Article of each Party included in Annex I. The greenhouse gas emissions by sources and removals by sinks associated with those activities shall be reported in a transparent and verifiable manner and reviewed in accordance with Articles 7 and 8.

This Article specifies three areas in forestry to be used for meeting the Parties' commitments to reduce GHG emissions, that is, ***afforestation, reforestation and deforestation*** since 1990. These terms, together with the operational concepts "direct human-induced changes" and "measuring of verifiable changes in stocks" pose some questions regarding **definitions**, and **breadth of included activities**. The use of existing definitions as given in the 1996 IPCC Guidelines[4] or from the FAO 1990 Forest Resources Assessment[5] would provide opportunities for subvention of the intent or the spirit of the Protocol. For example, if deforestation does not include harvesting (clear-cutting or selective), then the associated emissions are not counted in the change in stocks, while the ensuing reforestation is counted as sink. The same applies to forest degradation. However, it is expected that these issues will be resolved pursuant to Article 5, before the Protocol becomes law.

The above mentioned issues are further complicated by Article 3.7 which does not discriminate among activities in LUCF for the purpose of determining base year inventory of GHG emissions which are critical in verifying compliance.(see Box 3).

BOX 3: Articles 3, Paragraph 7 Kyoto Protocol

……..
Those Parties included in Annex I for whom land-use change and forestry constituted a net source of greenhouse gas emissions in 1990 shall include in their 1990 baseline emissions year or period the aggregate anthropogenic carbon dioxide equivalent emissions by sources minus removals by sinks in 1990 from land-use change for the purposes of calculating their assigned amount.

Although Articles 6 and 17 (Box 4) govern the provisions for transfer of emission credits from one Annex 1 Party to another through Joint Implementation and Emission Trading, these two do not involve non-Annex 1 countries except where the credits involved accrued from CDM. Activities in tropical countries which are pertinent to the commitments of Annex 1 Parties are those covered under Article 12 paragraph 2 & 3 (b) as shown in Box 5.

BOX 4: Articles 6..Joint Implementation

"For the purpose of meeting its commitments under Article 3, any Party included in Annex I may transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions by sources or enhancing anthropogenic removals by sinks of greenhouse gases in any sector of the economy…" [Article 6.1]".
"Any such project provides a reduction in emissions by sources, or an enhancement of removal by sinks, that is additional to any that would otherwise occur; " [Article 6.1(b)]".

Article 17: Emission Trading

…….The Parties included in Annex B may participate in emissions trading for the purpose of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitment under that Article.

BOX 5: Article 12: Clean Development Mechanism:

Paragraph 2: The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.

Paragraph 3 (b): Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3 as determined by the conference of the Parties serving as the meeting of the Parties to this Protocol.

3.1: Activities Jointly Implemented

In preparation for joint efforts by signatories of the FCCC to meet the objectives of the Rio Convention, a pilot phase of activities to reduce GHG emissions or sequester carbon was carried out by various Parties, mostly between Annex I and other countries. These projects were intended to provide some answers to some key questions, which would govern such joint efforts under the Convention, or under an ensuing Protocol. As of mid-1998, 113 pilot projects in both energy and land use sectors were either planned or under way, 99 of which had been reported to the FCCC AIJ Secretariat[6]. These projects were to be the forerunners for those activities mentioned in Article 12 of the Kyoto Protocol.

In 1993, the Dutch FACE Foundation (Forests Absorbing Carbon dioxide Emissions) which was seeking to establish forest projects to sequester the equivalent CO2 emitted by Dutch power companies, entered into a collaborative agreement with Innoprise Corporation of Sabah, Malaysia (ICSB) to establish a pilot carbon offset project. ICSB is the commercial arm of Sabah Foundation established in 1966 with an objective to uplift the quality of life of people in Sabah, and it funds most of its operations through timber sales from its 1 million-hectare concession. The main purpose of the project was to undertake Enhanced Natural Regeneration/Reforestation (ENR) of degraded areas with native species (mostly dipterocarps), with an initial target of reforesting 2012 ha by 1994 at a cost of

about U.S. $ 1.3 million. In addition to the operational aspects (seeds, nursery, planting, tending etc), this project included a research and demonstration component. The carbon benefits from this project have been estimated at 183 tC/ha over a 60-year rotation, though there has been some questions regarding the validity of the underlying assumptions[7]. On the basis of initial investment alone (the bulk of costs for enrichment planting), it would seem to cost about U.S. $ 3.53 /tC sequestered, which should qualify as an offset depending on the fate of the sequestered biomass. If there are no temporal considerations with respect to the sequestered carbon, conversion of the area to other land uses of less carbon density would eliminate the offset claim. However, if the area is used for sustainable timber production, and more so if this substitutes for non-sustainably produced timber, this project provides a real and certifiable way of meeting the Kyoto commitments at a relatively low cost.

The second phase of the project, which began in June 1995 has been completed and a new contract for phase three covering 4500 ha was signed earlier this year[8]. This seems on target for the ICSB and FACE plan of expanding the project to eventually cover 25,000 ha in Borneo, as a part of the Dutch power companies plan to sequester carbon in 150,000 ha, mostly in the tropics.

In 1992, the US electric generating company New England Power (NEP), which has since been acquired by another company US Generating Company Inc (USGEN) began a reduced impact logging in collaboration with Innoprise Corp in Sabah Malaysia, with a specific objective of reducing the amount of carbon emitted via the extensively used conventional logging techniques[9] This creative harvesting approach (RIL), involves reduction of collateral emissions from logging through operations such as pre-felling tree marking and mapping, climber cutting, directional felling, as well as appropriate design and use of roads, skidding trails and log landing sites. RIL also includes post-harvesting site operations such as closure of logging roads, cross drains, and rehabilitation of landing sites.

The associated reduction in carbon emissions and enhanced sequestration is estimated at 65 tC/ha over the logging cycle of the coupe, at an estimated cost of less than U.S. $ 4.00 /tC. The initial phase of the project, which was concluded in 1995 covered 1415 ha, and the project is in the second phase, with a total of 2400 ha so far harvested using RIL. The initial indication drawn from these pilot projects show that the cost of meeting part of Annex B's commitments through enhanced natural regeneration and reduced impact logging is much lower than the cost of meeting the commitments domestically. In fact, the current estimates by the U.S. for meeting its commitments under Kyoto range between $14/tC to $23/tC even after including *carbon trading, joint implementation and meaningful participation by non-Annex B countries*[10]. Despite the apparent cost effectiveness of these GHG mitigation measures in tropical forestry, the question still remains as to how do these two types of projects fit under the Kyoto Protocol, specifically after the fourth meeting of the Parties (COP4) in Buenos Aires.

3.2 ENR and RIL under Kyoto

The Innoprise/FACE (ENR) Project is a **"Reforestation"** activity, which is explicitly included under Article 3. Since the project is located in a non-Annex B[h] country, any accrued emission credits can only be used to meet Annex I Party commitments via CDM, and consequently they can be transferred through JI or trading. The legitimacy of the ENR project as a CDM project draws from the explicit recognition of this activity in the commitment clause though not explicitly mentioned under CDM. The only remaining issues would therefore seem to be technical, especially related to meeting the measurability, permanence, additionality and certification as stipulated in Article 12 Paragraph 5. However, these are generic issues, which apply to all CDM projects in all sectors.

[h] Annex B constitutes 40 countries which have emission limitation and reduction commitment under the Kyoto Protocol.

On the other hand, the Innoprise/NEP (RIL) Project is not as easy to classify as the ENR project, since it does not fit neatly under the three activities currently allowed under Kyoto in LUCF, i.e*., reforestation, afforestation and deforestation.* As the Protocol currently stands, emissions from "forest harvesting" (clear-cutting or selective logging), are not included, and by extension credits from reducing emissions from harvesting would have no standing. The RIL project (or other similar projects) can still be included under a definitional argument, which would consider conventional logging as a deforestation or forest degradation process for the purpose of GHG emissions. To make such a case, one runs into the problem of whether the concession area would have eventually been reforested without the project, and how much is the carbon credit "additional" to the projected baseline. Under Articles 3 and 6, credits for reforestation of a harvested area are counted, but under the CDM route, they must meet the additionality criteria. With this in mind, it seems less likely for RIL projects to be included via a broad interpretation of definitions approach.

The other avenue through which the RIL project could be under the umbrella of the Protocol is the Article 3 Paragraph 4 clause on mechanisms and modalities for revising the list of activities currently included in LUCF and agricultural soils (Box 6).

BOX 6: Article 3, Paragraph 4 Kyoto Protocol

……..

The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session or as soon as practicable thereafter, decide upon modalities, rules and guidelines as to how, and which, **additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and the land-use change and forestry categories shall be added to, or subtracted from, the assigned amount for Parties included in Annex I**, taking into account uncertainties, transparency in reporting, verifiability, the methodological work of the IPCC, the advice provided by the SBSTA in accordance with Article 5 and the decisions of the Conference of the Parties……..

To the extent that the RIL activity can be shown to lead to "**verifiable changes in stocks**" and that the credits will be awarded "**for actions not circumstances**", the project is a good candidate for inclusion under the Protocol, since it will open an extensive avenue of emission reduction in an area which encompasses the entire tropical biome.

Furthermore since Article 2 requires Parties to implement GHG mitigation policies and measures while taking into account prior commitments under relevant international environmental agreements and promotion of sustainable forest management practices, afforestation and reforestation (Article 2 Paragraph 1 (a) (ii)), both the ENR and RIL projects would seem to enhance this objective.

However, the modalities have to be worked in such a way that any new activity promotes the core objective of the Convention and does not lead to subvention of the spirit of the Protocol[11]. For example, they have to guard against a perverse incentive which exists when a benefactor of a C-offset project does influence the amount of credits obtained from a project by negatively affecting the extent of emissions from adjacent or designated baseline (without project) sites. As such, a concessionaire who has a RIL CDM or AIJ project but also conducts conventional logging in an area, which is being used as a baseline, will have an incentive to maximize damage on the non-project site. In this case, monitoring and evaluation must include adherence to known past practices and logging laws and regulations. For example, it would not be expected that the baseline for future RIL projects be on an Innoprise concession area, so as to avoid any seeming conflict of interest.

4.0 Conclusion

The Kyoto Protocol for implementation of the UNFCCC includes the land use change and forestry sector as a source and sink of GHG, and identifies areas where emission reduction and carbon sequestration can be undertaken by Parties to the Convention under different obligations and arrangement. The Protocol also provides a mechanism for revising the list of included activities, and modalities for elaboration of operational definitions and necessary methodologies for implementation of the Convention.

When examined under the Articles of the Protocol, the generic structure of the Innoprise/FACE project on reforestation is well covered under the Kyoto Protocol of UNFCCC and should qualify for JI status and CDM financing. On the other hand the Innoprise/NEP reduced impact logging only qualifies under a broad interpretation of the definitions of terms in the relevant Articles of the Protocol. However, RIL and similar projects would seem to be good candidates for activities to be included under CDM on account of their verifiable emission reduction potential and other environmental and resource benefits associated with them. As such, they should be strongly recommended to the Subsidiary Body for Scientific and Technological Advice of the IPCC (SBSTA) for consideration under Article 3 Paragraph 4.

REFERENCES

[1] Houghton, J.T., Meira Feilho, L.G., Callander, B.A., Harris, N., Kattenberg, A. and Maskell, K. (Eds.): 1996, *Climate change 1995 - The Science of Climate Change: Summary for Policymakers. Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).* Cambridge University Press.

[2] IPCC 1996, as in Houghton *et al op cit.*

[3] http://www.unfccc.de (for detail of the Kyoto Protocol)

[4] IPCC. 1996. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. London, Hadley Center.

[5] FAO. 1993. Forest Resources Assessment 1990: Tropical Countries. FAO Forestry Paper No 112. Rome

[6] Joint Implementation Quarterly (JIQ). 1998, Vol 4 No 3. As quoted in Sathaye *et al* 1999: Concerns About Climate Change Mitigation Projects: Summary of Findings from Case Studies in Brazil, India, Mexico and South Africa. In: *Environmental Science and Policy*, forthcoming.

[7] Costa, Moura. 1996.Tropical Forestry Practices for Carbon Sequestration: A Review and Case Study from Southeast Asia. *Ambio vol. 25 no. 4*. Royal Swedish Academy of Sciences.

[8] Borneo Daily Express, June 26, 1998.

[9] Anon.1998. The Innoprise CO_2 Emission Offset Project. New England Power and Innoprise Corporation Sdn. Bhd. (Contact: http://www.nees.com or ICSB, Sabah, Malaysia)

[10] U.S. Govt. July 1998. The Kyoto Protocol and the President's Policies to Address Climate Change: The Administration's Economic Analysis.

[11] http://appli1.oecd.org/ENV/ See "Some technical issues regarding land-use change and forestry in the Kyoto Protocol by B. Schlamadinger and G.Marland)